

Appl. No. 09/655,755  
Amdt. Dated December 28, 2004  
Reply to Office action of September 7, 2004  
Attorney Docket No. P12103-US1  
EUS/JIP/04-2204

### Amendments to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

### Listing of Claims:

1. (Currently Amended) A method of designing a digital filter, including the steps of:  
  - first, determining a real-valued discrete-frequency representation of a desired full length digital filter;
  - second, transforming said real-valued discrete-frequency representation into a corresponding discrete-time representation;
  - third, circularly shifting said discrete-time representation; and
  - fourth, applying a shortening window to said discrete-time representation to produce a zero-padded reduced length filter.
2. (Currently Amended) The method of claim 1, further including the step of circularly shifting said zero-padded reduced length filter to remove leading zeroes.
3. (Previously Presented) The method of claim 1, wherein said real-valued discrete-frequency representation is formed by a noise suppressing spectral subtraction algorithm.
4. (Previously Presented) The method of claim 1, wherein said real-valued discrete-frequency representation is formed by a frequency selective non-linear algorithm for echo cancellation.
5. (Currently Amended) The method of claim 1, wherein said shortening window is a Kaiser window.

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6. (Currently Amended) The method of claim 1, further including the step of transforming said zero-padded reduced length filter into a minimum phase filter.

7. (Currently Amended) A digital convolution method, including the steps of:

first, determining a real-valued discrete-frequency representation of a desired full length digital filter;

second, transforming said real-valued discrete-frequency representation into a corresponding discrete-time representation;

third, circularly shifting said discrete-time representation;

fourth, applying a shortening window to said discrete-time representation to produce a zero-padded reduced length filter; and

fifth, convolving an input signal with said zero-padded reduced length filter.

8. (Currently Amended) The method of claim 7, further including the step of circularly shifting said zero-padded reduced length filter to remove leading zeroes.

9. (Currently Amended) The method of claims 7, further including the step of transforming said zero-padded reduced length filter into a minimum phase filter.

10. (Currently Amended) The method of claim 7, ~~including the step of performing the convolution step in the time domain wherein the step of convolving includes the step of performing a convolution in the time domain~~ using the discrete-time representation of said zero-padded reduced length filter.

11. (Currently Amended) The method of claim 7, ~~further including the step of performing the convolution step wherein the step of convolving includes the step of performing a convolution~~ in the frequency domain by using an overlap-add method.

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12. (Currently Amended) The method of claim 7, ~~further including the step of performing the convolution step wherein the step of convolving includes the step of performing a convolution~~ in the frequency domain by using an overlap-save method.

13. (Currently Amended) A digital filter design apparatus, including:  
means for determining a real-valued discrete-frequency representation of a desired full length digital filter;

means, coupled to the output of said means for determining a real-valued discrete-frequency representation, for transforming said real-valued discrete-frequency representation into a corresponding discrete-time representation;

means, coupled to the output of said means for transforming said real-valued discrete-frequency representation, for circularly shifting said discrete-time representation; and

means, coupled to the output of said means for circularly shifting said discrete-time representation, for applying a shortening window to said discrete-time representation to produce a zero-padded reduced length filter.

14. (Currently Amended) The apparatus of claim 13, further including means for circularly shifting said zero-padded reduced length filter to remove leading zeroes.

15. (Currently Amended) The apparatus of claim 13, wherein said ~~window applying means~~ the shortening window applying means implements a Kaiser window.

16. (Currently Amended) The apparatus of claim 13, further including means for transforming said zero-padded reduced length filter into a minimum phase filter.

17. (Currently Amended) A digital convolution apparatus, including:

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means for determining a real-valued discrete-frequency representation of a desired full length digital filter;

means, coupled to the output of said means for determining a real-valued discrete-frequency representation, for transforming said real-valued discrete-frequency representation into a corresponding discrete-time representation;

means, coupled to the output of said means for transforming said real-valued discrete-frequency representation, for circularly shifting said discrete-time representation;

means, coupled to the output of said means for circularly shifting said discrete-time representation, for applying a shortening window to said discrete-time representation to produce a zero-padded reduced length filter; and

means, coupled to the output of said means for applying a shortening window to said discrete-time representation, for convolving an input signal with said zero-padded reduced length filter.

18. (Currently Amended) The apparatus of claim 17, further including means for circularly shifting said zero-padded reduced length filter to remove leading zeroes.

19. (Currently Amended) The apparatus of claims 17, further including means for transforming said zero-padded reduced length filter into a minimum phase filter.

20. (Currently Amended) The apparatus of claim 17, further including means for performing the ~~convolution-step~~ convolution in the time domain using the discrete-time representation of said zero-padded reduced length filter.

21. (Currently Amended) The apparatus of claim 17, ~~further including wherein said means for performing the convolution-step~~ convolving comprises means

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for performing a convolution of said input signal in the frequency domain by using an overlap-add method.

22. (Currently Amended) The method of claim 17, ~~further including~~  
wherein said means for performing the convolution step convolving comprises means  
for performing a convolution of said input signal in the frequency domain by using an overlap-save method.

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